

MULTIMEDIA



UNIVERSITY

STUDENT ID NO

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MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2016/2017

BFS1024 – STATISTICS FOR FINANCE

(All sections / Groups)

29 MAY 2017
2.30 p.m. - 4.30 p.m.
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This question paper consists of TEN (10) printed pages inclusive of the cover page, formulae sheet and statistical tables.
2. This question paper consists of **FOUR** structured questions. Attempt **ALL** questions.
3. Students are allowed to use non-programmable scientific calculators with no restrictions. Statistical tables are attached at the end of the question paper.
4. Please use **pen** to write the answers.
5. Please print all your answers in the **Answer Booklet** provided.

Question 1 [Total = 25 Marks]

- (a) The average undergraduate grade point average (GPA) for the 15 top-ranked medical schools is listed below.

3.80 3.77 3.70 3.74 3.70 3.83 3.70 3.80
3.86 3.76 3.68 3.67 3.57 3.74 3.66

- i) Determine the mean and mode for the GPA of these top-ranked medical schools. Interpret your answers. [5 marks]
 - ii) Determine the variance and skewness for the GPA of these top-ranked medical schools. [7 marks]
- (b) A concerned parents group determined the number of commercials shown in each of five children's programs over a period of time. The distribution is presented below.

Number of Commercials	5	6	7	8	9
Probability	0.2	0.25	0.38	0.10	0.07

- i) Determine the probability to have at more than 7 commercials shown in children's program. [2 marks]
- ii) Find the mean and variance for the number of commercials shown in children's program. [9 marks]
- iii) Determine the waiting time needed for the children to get back to their program if each commercial takes approximately 28 seconds. [2 marks]

Question 2 [Total = 25 Marks]

- (a) Sports Scores Hotline in USA receives on average 8 calls per hour requesting the latest sport scores during FIFA World Cup season.
- i) Find the probability of at least 3 calls received during 10am to 11am. [6 marks]
 - ii) Find the probability of at most 1 call received in 10 minutes. [5 marks]
- (b) Assume that the systolic blood pressure of normal adults in Malaysia to be Normally distributed with mean of 120 mm Hg and standard deviation of 5.6 mm Hg.
- i) Find the probability of a normal adult to have systolic blood pressure between 115 mm Hg to 135 mm Hg. [6 marks]
 - ii) Adults with blood pressure greater than 140 mm Hg is considered to suffer from hypertension. Find the probability of Malaysian adults suffering from hypertension. [3 marks]
 - iii) Determine the systolic blood pressure that 95% of Malaysian adults have lower than it. [5 marks]

Continued...

Question 3 [Total = 25 Marks]

An insurance company claims that average speed at which men drive cars is greater than that of women drivers. In order to verify this, the company took a random sample of 27 cars driven by men on a highway and found the mean speed to be 72 miles per hour with a variance of 4.84 miles per hour. Another sample of 18 cars driven by women on the same highway gave a mean speed of 68 miles per hour with a variance of 6.25 miles per hour. Assume that the speeds at which all men and women drive cars on this highway are both normally distributed with the same population standard deviation.

- (a) Construct a 90% confidence interval for the population mean speed of men driving on this highway. [9 marks]
- (b) Test at 1% significance level whether the claim of the insurance company is true. [16 marks]

Question 4 [Total = 25 Marks]

A micro-economist wants to determine how corporate sales are influenced by capital and wage spending by companies. She proceeds to randomly select 26 large corporations and record information in millions of dollars. The Microsoft Excel output below shows results of this multiple regression.

SUMMARY OUTPUT				
ANOVA				
	<i>df</i>	SS	MS	
Regression	2			
Residual	23	7045072780	306307512	
Total	25	22624849820		
	Coeff	Std Error	<i>t Stat</i>	<i>P-value</i>
Intercept	15800	6038.2999	2.617	0.0154
Capital	0.1245	0.2045	0.609	0.5485
Wages	7.0762	1.4729	4.804	0.0001

- (a) Construct the linear regression equation. [2 marks]
- (b) Determine the coefficient of multiple determination and interpret your answer. [5 marks]
- (c) Test whether the model is significant at 5% significance level. [10 marks]
- (d) Test and determine which of the explanatory variable has significant impact on corporate sales. [8 marks]

End of Questions

STATISTICAL FORMULAE

A. DESCRIPTIVE STATISTICS

$$\text{Mean} = \frac{\sum X_i}{n}$$

$$\text{Standard Deviation (s)} = \sqrt{\frac{\sum X^2}{n-1} - \frac{(\sum X)^2}{n(n-1)}}$$

$$\text{Pearson's Coefficient of Skewness (S}_k\text{)} = \frac{3(\bar{X} - \text{Median})}{s} \text{ or } \frac{\bar{X} - \text{Mode}}{s}$$

B. PROBABILITY

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

$$P(A \text{ and } B) = P(A) P(B) \text{ if } A \text{ and } B \text{ are independent}$$

$$P(A | B) = P(A \text{ and } B) / P(B)$$

Poisson Probability Distribution

$$\text{If } X \text{ follows a Poisson Distribution } P(\lambda) \text{ where } P(X = x) = \frac{e^{-\lambda} \lambda^x}{x!}$$

$$\text{then the mean} = E(X) = \lambda \text{ and variance} = \text{VAR}(X) = \lambda$$

Binomial Probability Distribution

$$\text{If } X \text{ follows a Binomial Distribution } B(n, p) \text{ where } P(X = x) = {}^n C_x p^x q^{n-x}$$

$$\text{then the mean} = E(X) = np \text{ and variance} = \text{VAR}(X) = npq \text{ where } q = 1 - p$$

Normal Distribution

$$\text{If } X \text{ follows a Normal distribution } N(\mu, \sigma) \text{ where } E(X) = \mu \text{ and } \text{VAR}(X) = \sigma^2$$

$$\text{then } z = \frac{X - \mu}{\sigma}$$

C. EXPECTATION AND VARIANCE OPERATORS

$$E(X) = \sum [X \cdot P(X)]$$

$$\text{VAR}(X) = E(X^2) - [E(X)]^2$$

$$\text{If } E(X) = \mu \text{ then } E(kX) = k\mu, E(X + Y) = E(X) + E(Y)$$

$$\text{If } \text{VAR}(X) = \sigma^2 \text{ then } \text{VAR}(kX) = k^2 \sigma^2,$$

$$\text{VAR}(aX + bY) = a^2 \text{VAR}(X) + b^2 \text{VAR}(Y) + 2ab \text{COV}(X, Y)$$

$$\text{where } \text{COV}(X, Y) = E(XY) - [E(X)E(Y)]$$

D. CONFIDENCE INTERVAL ESTIMATION AND SAMPLE SIZE DETERMINATION

$$(100 - \alpha) \% \text{ Confidence Interval for Population Mean } (\sigma \text{ Known}) = \bar{X} \pm Z_{\alpha/2} \left(\frac{\sigma}{\sqrt{n}} \right)$$

$$(100 - \alpha) \% \text{ Confidence Interval for Population Mean } (\sigma \text{ Unknown}) = \bar{X} \pm t_{\alpha/2, n-1} \left(\frac{s}{\sqrt{n}} \right)$$

$$(100 - \alpha) \% \text{ Confidence Interval for Population Proportion} = p \pm Z_{\alpha/2} \sqrt{\frac{p(1-p)}{n}}$$

$$\text{Sample Size Determination for Population Mean} = n \geq \frac{(Z_{\alpha/2})^2 \sigma^2}{E^2}$$

$$\text{Sample Size Determination for Population Proportion} = n \geq \frac{(Z_{\alpha/2})^2 p(1-p)}{E^2}$$

Where E = Limit of Error in Estimation

E. HYPOTHESIS TESTING

One Sample Mean Test	
Standard Deviation (σ) Known	Standard Deviation (σ) Not Known
$Z = \frac{\bar{x} - \mu}{\sigma / \sqrt{n}}$	$t = \frac{\bar{x} - \mu}{s / \sqrt{n}}$
One Sample Proportion Test	
$Z = \frac{p - \pi}{\sqrt{\frac{\pi(1-\pi)}{n}}}$	

Two Sample Mean Test**Standard Deviation (σ) Known**

$$z = \frac{(\bar{x}_1 - \bar{x}_2)}{\sqrt{\sigma_1^2/n_1 + \sigma_2^2/n_2}}$$

Standard Deviation (σ) Not Known

$$t = \frac{(\bar{x}_1 - \bar{x}_2)}{\sqrt{S_p^2 \left(\frac{1}{n_1} + \frac{1}{n_2} \right)}} \quad \text{where} \quad S_p^2 = \frac{(n_1 - 1)S_1^2 + (n_2 - 1)S_2^2}{(n_1 - 1) + (n_2 - 1)}$$

Two Sample Proportion Test

$$z = \frac{(p_1 - p_2)}{\sqrt{p(1-p) \left[\frac{1}{n_1} + \frac{1}{n_2} \right]}} \quad \text{where} \quad p = \frac{(n_1 p_1) + (n_2 p_2)}{n_1 + n_2} = \frac{X_1 + X_2}{n_1 + n_2}$$

where X_1 and X_2 are the number of successes from each population

F. REGRESSION ANALYSIS**SIMPLE LINEAR REGRESSION:****Correlation Coefficient**

$$r = \frac{\sum XY - \left[\frac{\sum X \sum Y}{n} \right]}{\sqrt{\left[\sum X^2 - \left(\frac{(\sum X)^2}{n} \right) \right] \left[\sum Y^2 - \left(\frac{(\sum Y)^2}{n} \right) \right]}} = \frac{COV(X, Y)}{\sigma_X \sigma_Y}$$

Regression Coefficient

$$b_1 = \frac{\sum XY - \left[\frac{\sum X \sum Y}{n} \right]}{\left[\sum X^2 - \left(\frac{(\sum X)^2}{n} \right) \right]} \quad , \quad b_0 = \bar{Y} - b_1 \bar{X}$$

MULTIPLE LINEAR REGRESSION:

$$\text{Adjusted r-square} = 1 - \left[\frac{(1 - r^2)(n - 1)}{(n - p - 1)} \right] \text{ where } p = \text{number of independent variables}$$

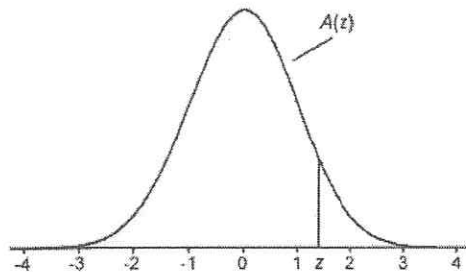
ANOVA Table for Multiple Linear Regression			
Source	Degrees of Freedom	Sum of Squares	Mean Squares
Regression	p	SSR	$\text{MSR} = \text{SSR}/p$
Error	$n - p - 1$	SSE	$\text{MSE} = \text{SSE}/(n - p - 1)$
Total	$n - 1$	SST	
Test Statistic for Significance of the Overall Regression Model = $F = \text{MSR}/\text{MSE}$			
Test Statistic for Significance of each Explanatory Variable = $t^* = b_i / S_{b_i}$ and the Critical $t = t_{(n-p-1), \alpha/2}$			

STATISTICAL TABLES

1

TABLE A.1

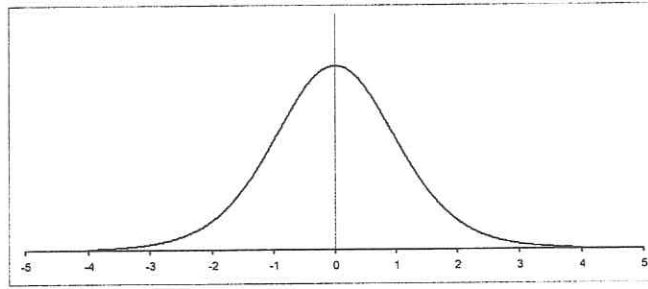
Cumulative Standardized Normal Distribution



$A(z)$ is the integral of the standardized normal distribution from $-\infty$ to z (in other words, the area under the curve to the left of z). It gives the probability of a normal random variable not being more than z standard deviations above its mean. Values of z of particular importance:

z	$A(z)$	
1.645	0.9500	Lower limit of right 5% tail
1.960	0.9750	Lower limit of right 2.5% tail
2.326	0.9900	Lower limit of right 1% tail
2.576	0.9950	Lower limit of right 0.5% tail
3.090	0.9990	Lower limit of right 0.1% tail
3.291	0.9995	Lower limit of right 0.05% tail

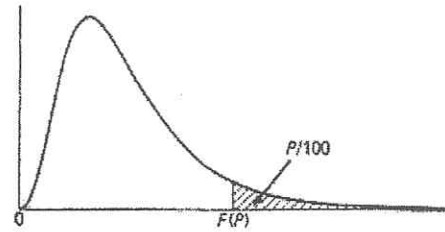
z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.4	0.9918	0.9920	0.9922	0.9925	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952
2.6	0.9953	0.9955	0.9956	0.9957	0.9959	0.9960	0.9961	0.9962	0.9963	0.9964
2.7	0.9965	0.9966	0.9967	0.9968	0.9969	0.9970	0.9971	0.9972	0.9973	0.9974
2.8	0.9974	0.9975	0.9976	0.9977	0.9977	0.9978	0.9979	0.9979	0.9980	0.9981
2.9	0.9981	0.9982	0.9982	0.9983	0.9984	0.9984	0.9985	0.9985	0.9986	0.9986
3.0	0.9987	0.9987	0.9987	0.9988	0.9988	0.9989	0.9989	0.9989	0.9990	0.9990
3.1	0.9990	0.9991	0.9991	0.9991	0.9992	0.9992	0.9992	0.9992	0.9993	0.9993
3.2	0.9993	0.9993	0.9994	0.9994	0.9994	0.9994	0.9994	0.9995	0.9995	0.9995
3.3	0.9995	0.9995	0.9995	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996	0.9997
3.4	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9998
3.5	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998
3.6	0.9998	0.9998	0.9999							

Table 2: The t-distribution ($t_{\alpha, df}$)

$\alpha =$	0.10	0.05	0.025	0.01	0.005	0.001	0.0005
df = 1	3.078	6.314	12.706	31.821	63.657	318.309	636.619
2	1.886	2.920	4.303	6.965	9.925	22.327	31.599
3	1.638	2.353	3.182	4.541	5.841	10.215	12.924
4	1.533	2.132	2.776	3.747	4.604	7.173	8.610
5	1.476	2.015	2.571	3.365	4.032	5.893	6.869
6	1.440	1.943	2.447	3.143	3.707	5.208	5.959
7	1.415	1.895	2.365	2.998	3.499	4.785	5.408
8	1.397	1.860	2.306	2.896	3.355	4.501	5.041
9	1.383	1.833	2.262	2.821	3.250	4.297	4.781
10	1.372	1.812	2.228	2.764	3.169	4.144	4.587
11	1.363	1.796	2.201	2.718	3.106	4.025	4.437
12	1.356	1.782	2.179	2.681	3.055	3.930	4.318
13	1.350	1.771	2.160	2.650	3.012	3.852	4.221
14	1.345	1.761	2.145	2.624	2.977	3.787	4.140
15	1.341	1.753	2.131	2.602	2.947	3.733	4.073
16	1.337	1.746	2.120	2.583	2.921	3.686	4.015
17	1.333	1.740	2.110	2.567	2.898	3.646	3.965
18	1.330	1.734	2.101	2.552	2.878	3.610	3.922
19	1.328	1.729	2.093	2.539	2.861	3.579	3.883
20	1.325	1.725	2.086	2.528	2.845	3.552	3.850
21	1.323	1.721	2.080	2.518	2.831	3.527	3.819
22	1.321	1.717	2.074	2.508	2.819	3.505	3.792
23	1.319	1.714	2.069	2.500	2.807	3.485	3.768
24	1.318	1.711	2.064	2.492	2.797	3.467	3.745
25	1.316	1.708	2.060	2.485	2.787	3.450	3.725
26	1.315	1.706	2.056	2.479	2.779	3.435	3.707
27	1.314	1.703	2.052	2.473	2.771	3.421	3.690
28	1.313	1.701	2.048	2.467	2.763	3.408	3.674
29	1.311	1.699	2.045	2.462	2.756	3.396	3.659
30	1.310	1.697	2.042	2.457	2.750	3.385	3.646
40	1.303	1.684	2.021	2.423	2.704	3.307	3.551
60	1.296	1.671	2.000	2.390	2.660	3.232	3.460
120	1.289	1.658	1.980	2.358	2.617	3.160	3.373
∞	1.282	1.645	1.960	2.326	2.576	3.090	3.291

TABLE 12(b). 5 PER CENT POINTS OF THE F-DISTRIBUTION

If $F = \frac{X_1/\nu_1}{X_2/\nu_2}$, where X_1 and X_2 are independent random variables distributed as χ^2 with ν_1 and ν_2 degrees of freedom respectively, then the probabilities that $F \geq F(P)$ and that $F \leq F(P)$ are both equal to $P/100$. Linear interpolation in ν_1 and ν_2 will generally be sufficiently accurate except when either $\nu_1 > 12$ or $\nu_2 > 40$, when harmonic interpolation should be used.



(This shape applies only when $\nu_1 \geq 3$. When $\nu_1 < 3$ the mode is at the origin.)

$\nu_1 =$	1	2	3	4	5	6	7	8	10	12	24	∞
$\nu_2 = 1$	161.4	199.5	215.7	224.6	230.2	234.0	236.8	238.9	241.9	243.9	249.1	254.3
2	18.51	19.00	19.16	19.25	19.30	19.33	19.35	19.37	19.40	19.41	19.45	19.50
3	10.13	9.552	9.277	9.117	9.013	8.941	8.887	8.845	8.786	8.745	8.639	8.526
4	7.709	6.944	6.591	6.388	6.256	6.163	6.094	6.041	5.964	5.912	5.774	5.628
5	6.608	5.786	5.409	5.192	5.050	4.950	4.876	4.818	4.735	4.678	4.527	4.365
6	5.987	5.143	4.757	4.534	4.387	4.284	4.207	4.147	4.060	4.000	3.841	3.669
7	5.591	4.737	4.347	4.120	3.972	3.866	3.787	3.726	3.637	3.575	3.410	3.230
8	5.318	4.459	4.066	3.838	3.687	3.581	3.500	3.438	3.347	3.284	3.115	2.928
9	5.117	4.256	3.863	3.633	3.482	3.374	3.293	3.230	3.137	3.073	2.900	2.707
10	4.965	4.103	3.708	3.478	3.326	3.217	3.135	3.072	2.978	2.913	2.737	2.538
11	4.844	3.982	3.587	3.357	3.204	3.095	3.012	2.948	2.854	2.788	2.609	2.404
12	4.747	3.885	3.490	3.259	3.106	2.996	2.913	2.849	2.753	2.687	2.505	2.296
13	4.667	3.806	3.411	3.179	3.025	2.915	2.832	2.767	2.671	2.604	2.420	2.206
14	4.600	3.739	3.344	3.112	2.958	2.848	2.764	2.699	2.602	2.534	2.349	2.131
15	4.543	3.682	3.287	3.056	2.901	2.790	2.707	2.641	2.544	2.475	2.288	2.066
16	4.494	3.634	3.239	3.007	2.852	2.741	2.657	2.591	2.494	2.425	2.235	2.010
17	4.451	3.592	3.197	2.965	2.810	2.699	2.614	2.548	2.450	2.381	2.190	1.960
18	4.414	3.555	3.160	2.928	2.773	2.661	2.577	2.510	2.412	2.342	2.150	1.917
19	4.381	3.522	3.127	2.895	2.740	2.628	2.544	2.477	2.378	2.308	2.114	1.878
20	4.351	3.493	3.098	2.866	2.711	2.599	2.514	2.447	2.348	2.278	2.082	1.843
21	4.325	3.467	3.072	2.840	2.685	2.573	2.488	2.420	2.321	2.250	2.054	1.812
22	4.301	3.443	3.049	2.817	2.661	2.549	2.464	2.397	2.297	2.226	2.028	1.783
23	4.279	3.422	3.028	2.796	2.640	2.528	2.442	2.375	2.275	2.204	2.005	1.757
24	4.260	3.403	3.009	2.776	2.621	2.508	2.423	2.355	2.255	2.183	1.984	1.733
25	4.242	3.385	2.991	2.759	2.603	2.490	2.405	2.337	2.236	2.165	1.964	1.711
26	4.225	3.369	2.975	2.743	2.587	2.474	2.388	2.321	2.220	2.148	1.946	1.691
27	4.210	3.354	2.960	2.728	2.572	2.459	2.373	2.305	2.204	2.132	1.930	1.672
28	4.196	3.340	2.947	2.714	2.558	2.445	2.359	2.291	2.190	2.118	1.915	1.654
29	4.183	3.328	2.934	2.701	2.545	2.432	2.346	2.278	2.177	2.104	1.901	1.638
30	4.171	3.316	2.922	2.690	2.534	2.421	2.334	2.266	2.165	2.092	1.887	1.622
32	4.149	3.295	2.901	2.668	2.512	2.399	2.313	2.244	2.142	2.070	1.864	1.594
34	4.130	3.276	2.883	2.650	2.494	2.380	2.294	2.225	2.123	2.050	1.843	1.569
36	4.113	3.259	2.866	2.634	2.477	2.364	2.277	2.209	2.106	2.033	1.824	1.547
38	4.098	3.245	2.852	2.619	2.463	2.349	2.262	2.194	2.091	2.017	1.808	1.527
40	4.085	3.232	2.839	2.606	2.449	2.336	2.249	2.180	2.077	2.003	1.793	1.509
60	4.001	3.150	2.758	2.525	2.368	2.254	2.167	2.097	1.993	1.917	1.700	1.389
120	3.920	3.072	2.680	2.447	2.290	2.175	2.087	2.016	1.910	1.834	1.608	1.254
∞	3.841	2.996	2.605	2.372	2.214	2.099	2.010	1.938	1.831	1.752	1.517	1.000